



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/691,746

10/22/2003

Dimitry Shur

8640

1979

7590 04/27/2009  
PATENT COUNSEL  
APPLIED MATERIALS, INC.  
Legal Affairs Department  
P.O. BOX 450A  
Santa Clara, CA 95052

EXAMINER

JOHNSTON, PHILLIP A

ART UNIT

PAPER NUMBER

2881

MAIL DATE

DELIVERY MODE

04/27/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/691,746	<b>Applicant(s)</b> SHUR ET AL.	
	<b>Examiner</b> PHILLIP A. JOHNSTON	<b>Art Unit</b> 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***Detailed Action***

1. This Office Action is submitted in response to the RCE/Amendment filed 2-24-09, wherein claims 1, 6, 11, and 15 have been amended. Claims 1-18 are pending.

***Examiners Response to Arguments***

2. The previously applied references are being applied in this rejection; however, the applicants arguments filed 2-24-2009 are moot in view of new grounds for rejection necessitated by the applicant's amendment.

All arguments filed 2-24-2009 regarding the currently applied references are specifically addressed in the rejection below.

***Claims Rejection – 35 U.S.C. 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowes, USPN 6,778,275, in view of Sawahata, USPN 6,501,077.

5. Regarding claims 11-16n, Bowes discloses in Figure 6 below, an overlay measurement mark having a box-in-box structure with a first layer 640 including

feature 410 and a second layer 630 with plural features located below the first layer, some of which are not overlapping (430, 450 etc.). See Col. 11, line 62-67; and Col. 12, line 1-13.

Regarding the newly amended limitation describing; an intermediate layer positioned between the first and second layers, Bowes discloses at Col. 12, line 6-13, that the overlay mark structure includes additional intermediary layers.

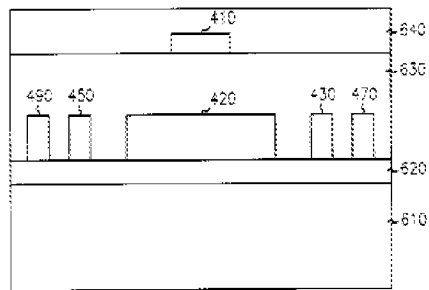
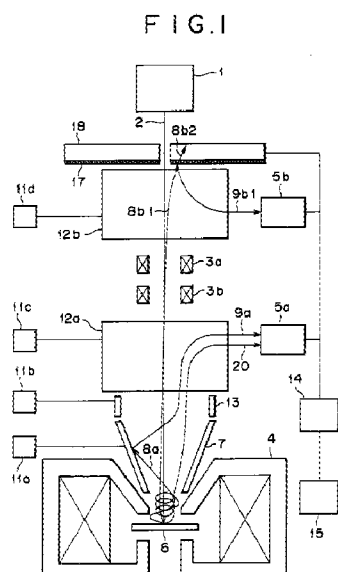


FIG. 6

Bowes also discloses at Col. 14, line 31-61, the use of a Scanning Electron Microscope (SEM) to scan the overlay mark and collect secondary electrons that are ejected and translated into an image. The overlay error is subsequently measured with the SEM based on displacement of the box-in-box structure including the inner box located on the second layer. In addition, one of ordinary skill in the art recognizes that collecting secondary electrons to generate an image with an SEM inherently includes the use of a detector and processor to perform these functions with an SEM.

Bowes fails to teach the detection of electrons reflected or scattered at small angles.

Sawahata discloses the use of an SEM to detect reflected electrons 8a generated at a low angle from the sample, using detector 5a. See Column 4, line 33-47; and Figure 1 below.



Sawahata also discloses measuring the energy distribution of electrons generated from the sample with the SEM detectors to determine information from images of the surface and below the surface of the sample, which one of ordinary skill recognizes would include detecting electrons reflected from layers beneath the surface layer of a specimen. Col. 7, line 47-67; and Col. 8, line 1-3.

Sawahata modifies Bowes to provide a scanning electron microscope (SEM) where reflective electrons generated from a sample at a low angle and at high angle are detected to provide information from the surface as well as information at depths below the surface of the sample.

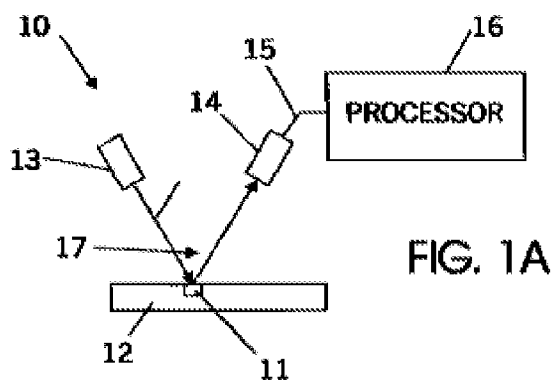
Therefore it would have been obvious to one of ordinary skill in the art that the overlay error detection apparatus of Bowes can be modified to use the detection of low

angle reflected electrons in accordance with Sawahata to provide a scanning electron microscope (SEM) that detects reflective electrons generated from a sample at both low and high angles, in order to obtain information indicative of the sample surface layer and layers beneath the sample surface, thereby improving the analytical performance of the SEM. Col. 6, line 24-37; and Col. 7, line 63-67.

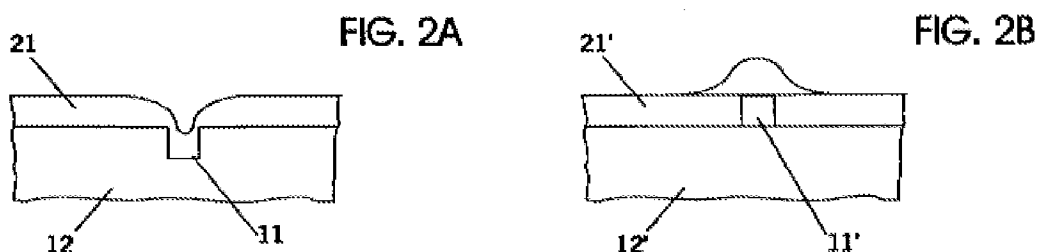
6. Claims 1-4, 6-9, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowes, USPN 6,778,275, in view of Sawahata, USPN 6,501,077, and in further view of Chen, USPN 6,064,486.

The combination of Bowes and Sawahata discloses the apparatus used in these claims, as described above regarding claims 11-16, but fails to disclose that the second feature formed on the second layer affects a shape of an area of the first layer.

Chen discloses at Col. 5, line 3-10 a primary electron beam (13) shown in Figure 1A below, directed to a feature 11 below the surface of a sample 12.



where the second layer of sample 12 includes a second feature (11 or 11') buried under the first layer 21 or 21', where the second feature effects the shape of an area in the first layer due to asymmetries of the coating process as shown in Figures 2A and 2B below. See also Col. 5, line 46-64.



Chen modifies the combination of Bowes and Sawahata to provide an apparatus for aligning a pattern by projecting a beam to underlying patterns and detecting the position of an alignment mark, where the alignment signal is a function of the topography of the alignment mark and all overlying layers, which make up the alignment signal model used identify the position of the new alignment mark. .

Therefore it would have been obvious to one of ordinary skill in the art that the the combination of Bowes and Sawahata can be modified to use the alignment signal model of Chen to detect an alignment mark based upon detecting the alignment signals resulting from process induced affects on the topography of the sample surface, thereby improving accuracy and accounting for nonlinear effects in both local and global alignment. Col. 15, line 1-43.

7. Claims 5 and 10 are rejected under 103(a) as being unpatentable over USPN 6,778,275, in view of Sawahata, USPN 6,501,077, and in further view of Hiroi, USPN 6,172,365.

8. Regarding claims 5 and 10 the combination of Bowes and Sawahata fails to teach the use of preliminary charging the second feature. However, Hiroi discloses pre-charging the sample surface to improve image resolution in an electron beam inspection apparatus. See Column 13, line 26-56.

Hiroi modifies the combination of Bowes and Sawahata to provide an electron beam inspection method, and apparatus, where the charge-up phenomenon is reduced by pre-charging the sample surface prior to an object being exposed to an electron beam.

Therefore it would have been obvious to one of ordinary skill in the art that the the combination of Bowes and Sawahata can be modified to use the pre-charge method of Hiroi, to provide an electron beam inspection method, and apparatus, for reducing the charge-up phenomenon and obtaining a high-contrast signal representing a physical property by using secondary electrons or back-scattered electrons obtained from the object. Col. 1, line 52-60.

### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571)272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ

April 22, 2009

/ROBERT KIM/

Supervisory Patent Examiner, Art Unit 2881

Application/Control Number: 10/691,746  
Art Unit: 2881

Page 9

Application/Control Number: 10/691,746  
Art Unit: 2881

Page 10